2015 AHA Guidelines for CPR and ECC: Time for a Change
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Disclosures
• Medtronic Foundation: Research Grant
• Physio-Control: EMS Fellowship Program Support

AHA CPR & ECC Guidelines Development Process in Past
Goals

• Reduce inventory of science with much more frequent “focused updates.”
• Adopt an internationally recognized, transparent system for evaluating scientific evidence.
• Encourage broad participation in the process
  — Enhance quality of scientific reviews
  — Speed development of revised guidelines

Grading of Recommendations Assessment, Development, and Evaluation (GRADE)

• Process to take evidence to guidelines
• Developed by key international groups
• Widely accepted internationally

GRADE: an emerging consensus on rating quality of evidence and strength of recommendations

Guidelines are inconsistent in how they rate the quality of evidence and the strength of recommendations. As a result, guidelines often lack transparency and are not easily compared. The GRADE system was developed to address these issues by providing a framework for grading the quality of evidence and the strength of recommendations. This system is used to help healthcare professionals make evidence-based decisions.
GRADE

• Offers a transparent and structured process for developing and presenting summaries of evidence, including its quality, for systematic reviews and recommendations in health care.
• Provides guideline developers with a comprehensive and transparent framework for carrying out the steps involved in developing recommendations.
• Use is appropriate and helpful irrespective of the quality of the evidence: whether high or very low.
• Does not eliminate the inevitable need for judgments.

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DRAFTS
The information provided is currently in DRAFT format and is NOT a FINAL version.
Vasopressors for cardiac arrest
(1. Epi v Placebo)

The information provided is currently in DRAFT format and is NOT a FINAL version

Consensus on Science:
For all four long term (critical) and short term (important) outcomes, we found one underpowered trial that provided low quality evidence comparing SDE to placebo (Jacobs, 2001, 1138). Among 534 subjects, there was uncertain benefit or harm of SDE over placebo for the critical outcomes of survival to discharge [RR 2.12, 95% CI 0.75-6.02, p=0.16] and good neurological outcome defined as CPC of 1-2 [RR 1.73, 95% CI 0.59-5.11, p=0.32]. However, patients who received SDE had higher rates of the two important outcomes of survival to admission [RR 1.95, 95% CI, 1.34-2.84, p=0.0004] and ROSC in the prehospital setting [RR 2.80, 95% CI 1.78-4.41, p<0.00001] compared to those who received placebo.

Treatment Recommendation
Given the observed benefit in short term outcomes, we suggest Standard Dose Epinephrine be administered to patients in cardiac arrest (weak recommendation, low quality).

Values and Preferences Statement:
In making this statement, we place value on the short-term outcomes of ROSC and survival to admission, and our uncertainty about the absolute effect on survival and neurological outcome.

Public Comments
Dispatcher Instruction in CPR

Consensus on Science
For the critical outcome of survival, we have identified very low to moderate quality evidence from three RCTs (one reporting outcomes at one day, 30 days, and hospital discharge [Svensson 2010, 434]; one to hospital admission and hospital discharge [Hallstrom 2000, 190]; and one to hospital discharge only [Rea 2010, 423]). Hüpf [2010, 1552] meta-analysed the three RCTs (moderate quality) and found an absolute survival benefit of 2.4% (95%CI 0.1%-4.9%) in favour of continuous chest compressions over traditional CPR (NNT 41; (95%CI 20-1,250); RR 1.22 (95%CI 1.01-1.46)).

Dispatcher Instruction in CPR

Treatment Recommendation
We recommend that dispatchers should provide CPR instructions to callers in order to improve survival from OHCA. (serious indirectness, strong recommendation, moderate quality of evidence). We recommend that dispatchers should provide CPR instructions to callers in order to improve bystander CPR rates (some indirectness, strong recommendation, low to very low quality of evidence).

CPR Prior to Defibrillation

Consensus on Science
For the critical outcome of survival to hospital discharge with favorable neurological outcome (define as CPC score ≤ 2, MRS score ≤ 3), we identified low grade evidence (downgraded for inconsistency and imprecision) from 4 RCTs (OR 0.95, 95% CI (0.786 to 1.15)). For the critical outcome of survival to one year with good neurological function (CPC ≤ 2), we identified low grade evidence (downgraded for bias and imprecision) from a single trial (OR 1.18, 95% CI (1.01 to 1.36)). For the critical outcome of survival to hospital discharge, we identified low grade evidence (downgraded for bias and imprecision) from 4 RCTs (OR 1.095, 95% CI (0.695 to 1.725)). For the critical outcome of survival to one year we identified low grade evidence (downgraded for bias and imprecision) from 2 RCTs (OR 1.15, 95% CI (0.625 to 2.155)). With respect to ROSC, we identified low grade evidence (downgraded for bias and imprecision) from 4 RCTs (OR 1.193, 95% CI (0.871 to 1.654)).
CPR Prior to Defibrillation

Treatment Recommendation
We suggest an initial period of CPR for 30-60 seconds while the defibrillator is being applied (weak recommendation based on low quality evidence).

Impedance Threshold Device + Standard CPR (I) vs Standard CPR (C):
Consensus on Science
For the critical outcome of neurologically intact survival at hospital discharge (assessed with Modified Rankin ≤ 3), there was one RCT (Aufderheide 2011, 798) of high quality in 8718 out-of-hospital cardiac arrests that was unable to demonstrate a clinically significant benefit from the addition of the ITD to standard CPR: RR 0.97 (95% CI 0.82 to 1.15).

For the critical outcome of survival to hospital discharge, there was one RCT (Aufderheide 2011, 798) of high quality in 8718 out-of-hospital cardiac arrests that was unable to demonstrate a clinically significant benefit from the addition of the ITD to standard CPR: RR 1 (95% CI 0.87 to 1.15).

Impedance Threshold Device + Active Compression Decompression CPR (I) vs Standard CPR (C):
Consensus on Science
For the critical outcome of neurologically intact survival at 12 months (assessed with CPC ≤ 2), there was one RCT (Frascone 2013, 1214) of very low quality (downgraded for risk of bias and suspected publication bias) in 2738 out-of-hospital cardiac arrests that was unable to demonstrate a clinically significant benefit from the addition of the ITD to ACD CPR (when compared with standard CPR): RR 1.34 (95% CI 0.97 to 1.85).

For the critical outcome of neurologically intact survival at hospital discharge (assessed with CPC ≤ 2), there was one RCT (Frascone 2013, 1214, which incorporated data published in Aufderheide 2011, 301) of very low quality (downgraded for risk of bias, inconsistency, and suspected publication bias) in 2738 out-of-hospital cardiac arrests that was unable to demonstrate a clinically significant benefit from the addition of the ITD to ACD CPR (when compared with standard CPR): RR 1.28 (95% CI 0.98 to 1.69).
Treatment Recommendation (DRAFT)

Impedance Threshold Device + Standard CPR (I) vs Standard CPR (C):
We recommend against routine use of ITD in addition to standard CPR (strong recommendation, high quality of evidence). Values and preferences statement: In making this recommendation we place a higher value on not allocating resources to an ineffective intervention over any yet to be proven benefit for critical or important outcomes.

Impedance Threshold Device + Active Compression Decompression CPR (I) vs Standard CPR (C):
We suggest against the routine use of ITD in addition to Active Compression Decompression CPR (weak recommendation, very low quality of evidence). Values and preferences statement: In making this recommendation we place a higher value on not allocating resources to an ineffective intervention over any yet to be proven benefit for critical or important outcomes.

Impedance Threshold Device + Active Compression Decompression CPR (I) vs Standard CPR (C):
We suggest against the routine use of ITD in addition to Active Compression-Decompression CPR as an alternative to standard CPR (weak recommendation, very low quality of evidence). Values and preferences statement: In making this recommendation we place a higher value on not allocating resources to an intervention with equivocal benefit for critical or important outcomes.

Analysis of Rhythm during Chest Compression

Consensus on Science
There are currently no human studies that address the identified critical outcomes criteria of neurologically intact survival, survival or ROSC or the important outcomes criteria of CPR quality, time to commencing CPR or time to first shock.

Treatment Recommendation
We suggest against the use of artifact-filtering algorithms for analysis of ECG rhythm during CPR unless as part of a research programme.
Peds Compression Depth

Consensus on Science
For the critical outcomes of “survival with good neurological outcome” and “survival to hospital discharge” we have identified very low quality evidence (downgraded for indirectness and imprecision) from one observational study, (Sutton 2014 1179) enrolling 89 cardiac arrest events, showing those who received chest compression of > 51 mm trended to better survival but did not reach significance.

Peds Compression Depth

Treatment Recommendation
We suggest that in infants, rescuers should be taught to compress the chest by at least one third the anterior-posterior dimension or approximately 1½ inches (4 cm). In children, rescuers should be taught to compress the chest by at least one third the anterior-posterior dimension or approximately 2 inches (5 cm).

Mechanical Chest Compression

Consensus on Science
Mechanical Chest Compression

Treatment Recommendation

We suggest mechanical chest compression devices should not be considered the standard of care for cardiac arrest patients, but can be considered a reasonable alternative to high quality manual chest compressions in some settings (weak recommendation, moderate quality of evidence).

Values and preferences statement: In making this recommendation we place value on data from a large, high-quality RCT demonstrating equivalence between high quality manual chest compressions and manual chest compressions (Wik).

Local considerations such as relative costs and resource availability for maintenance of high quality manual chest compressions and mechanical chest compression device implementation should guide decisions around which mode of chest compression delivery is most appropriate. Also, there may be scenarios not directly addressed in the literature reviewed to support this treatment recommendation such as CPR in a moving ambulance, in the angiography suite or during preparation for ECLS, where mechanical chest compressions are more practical.

Advanced airway placement (ETT vs SGA)

Consensus on Science

Supraglottic airways (SGAs: Combitube, LMA, laryngeal tube) versus tracheal intubation

For the critical outcome of favourable neurological survival, we have identified low quality evidence from one observational study of 5277 OHCAs showing no difference between tracheal intubation and insertion of a SGA (adjusted OR 0.71; 95% CI 0.39 – 1.30) [Kajino 2011 R236], from one observational study of 281,522 OHCAs showing higher rates of favourable neurological outcome between insertion of a SGA and tracheal intubation (OR 1.11; 95% CI 1.0 – 1.21) [Hasegawa 2011 257] and from two studies showing higher rates of favourable neurological outcome between tracheal intubation and insertion of a SGA (8701 OHCAs adjusted OR 1.44; 95% CI 1.10 – 1.88 [McMullan 2014 617]) and (10,455 OHCAs adjusted OR 1.40; 95% CI 1.04 – 1.89 [Wang 2012 1061]).

Advanced airway placement (ETT vs SGA)

Treatment Recommendation

We suggest using either a supraglottic airway or tracheal tube as the initial advanced airway management during CPR (weak recommendation, very low quality evidence) for out of hospital cardiac arrest.
Ventilation rate during continuous chest compression

**Consensus on Science**

We did not identify any evidence to address the critical outcomes of Survival with favorable neurological/functional outcome at discharge, 30 days, 60 days, 180 days AND/OR 1 year Survival at discharge, 30 days, 60 days, 180 days AND/OR 1 year.

We identified very low quality evidence (downgraded for very serious risk of bias and indirectness, and serious inconsistency and imprecision) from 10 animal studies (Sanders 2002 S53, Aufderheide 2004 s345, Aufderheide 2004 1966, Yannopoulos 2004 75, Yannopoulos 2006 1444, Hayes 2007 357, Cavus 2008 118, Hwang 2008 183, Gazmuri 2012 259, Kill 2014 e89) and 1 human non-RCT (Abella 2005 305) that does not enable us to estimate the effect of a ventilation rate of 10 per minute compared to any other rate for the important outcome of ROSC with confidence.

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Ventilation rate during continuous chest compression

**Treatment Recommendation**

We suggest a ventilation rate of 10 breaths per minute in adults with cardiac arrest with a secure airway receiving continuous chest compressions (weak recommendation, very low quality evidence).

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Induced Hypothermia

**Consensus on Science**

For the critical outcome of “survival with good neurological outcome,” we...
Induced Hypothermia

Consensus on Science
Is there evidence for an ideal temperature (I) when using targeted temperature management?

Induced Hypothermia

Treatment Recommendation

Induced Hypothermia (timing)

Consensus on Science
The hospital induction of therapeutic hypothermia (I) vs induction of therapeutic hypothermia after arrival to the hospital (E).
For the clinical outcome of "survival with good neurological outcome," we have identified moderate
Induced Hypothermia (timing)

Treatment Recommendation

We recommend against prehospital induction of hypothermia for OHCA (strong recommendation, moderate quality of evidence) with cold saline given the current evidence does not demonstrate survival benefit or favorable neurologic outcome and one large study utilizing cold intravenous fluid suggests possible increased risk of harm related to prehospital initiation of induced hypothermia. We suggest against prehospital cooling in general given the lack of evidence of efficacy in the face of the need for additional resource allocation.

First Aid Use of Tourniquet

Consensus on Science

For the critical outcome of “mortality”, low quality evidence from two human studies with a comparison group (evidence downgraded for risk of bias) enrolling 355 patients showing no difference where 4% (3/71) of patients who had a tourniquet applied died compared to 4% (10/284) of patients who did not have a tourniquet applied (RR 1.2 (0.34 – 4.25)) (Beekley 2008, s28; Passos 2014, 573) and very low quality evidence six human case series studies (evidence downgraded for risk of bias) enrolling 808 patients, where 10% (82/808) of those patients who had tourniquet applied died (Brodie 2007, 74; King 2012, 33; Kragh 2011, 590; Kragh 2012, 1362; Lakstein 2002, s221; Tien 2006, 174).

Use of Tourniquet

Treatment Recommendation

We suggest a tourniquet be used when standard first aid hemorrhage control cannot control bleeding by first aid providers (weak recommendation, low quality of evidence).

Values and preferences statement: In making this recommendation, we place increased value on the benefits of hemostasis, which outweigh the risks. The cost of the intervention is moderate.
PCI after ROSC without ST-elevation

Consensus on Science:
For the important outcome of “survival to hospital discharge” we have identified very low quality evidence (downgraded for risk of bias) from 2 observational studies enrolling 513 patients showing benefit (OR 0.51 95% CI 0.35 – 0.73).

For the important outcome of “neurologically intact survival” we have identified very low quality evidence (downgraded for risk of bias) from 2 observational studies enrolling 513 patients showing benefit (OR 0.51 95% CI 0.35 – 0.74).

Treatment Recommendation
We suggest emergent cath lab evaluation in comparison to cardiac catheterization later in the hospital stay or no catheterization for adult patients who are experiencing ROSC after cardiac arrest without evidence of ST-elevation on ECG (weak recommendation, very low quality of evidence).

Real-Time Feedback for CPR Quality

Consensus on Science
For the critical outcome of “survival to hospital discharge” we identified moderate quality evidence from one cluster randomised [Hostler 2011 p342] representing 1586 patients and very low evidence from four observational studies in adults [Abella 2007 p54; Bobrow 2013 p47; Kramer-Johansen 2006 p283; Sainio 2013 p50] and one observational study in children [Sutton 2014 p70] representing 1192 patients. All studies were downgraded due to risk of bias. The randomised trial found no difference in the number of patients who achieved survival to hospital discharge (control 44.7% vs 44.3%, p=0.962). No studies showed a statistically significant difference in survival to hospital discharge with the use of CPR feedback. Effect of CPR feedback on survival to hospital discharge ranged from -0.9 to +5.2.
Real-Time Feedback for CPR Quality

Treatment Recommendation
Within the focused scope of this question, we suggest against routine implementation of CPR feedback devices in systems in which they are currently not used (weak recommendation, very low quality of evidence). In systems currently using CPR feedback devices we suggest the devices may continue to be used that there is no evidence suggesting significant harm (weak recommendation, very low quality of evidence).

Values and preferences statement: In making this recommendation, we place a higher value on resource allocation and cost effectiveness than widespread implementation of a technology with uncertain effectiveness.

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